NASA/SP—1998–7037/SUPPL378
July 10, 1998

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

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01 Aeronautics 1

02 Aerodynamics 2

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

03 Air Transportation and Safety 7

Includes passenger and cargo air transport operations; and aircraft accidents.

04 Aircraft Communications and Navigation 12

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

05 Aircraft Design, Testing and Performance 13

Includes aircraft simulation technology.

06 Aircraft Instrumentation 14

Includes cockpit and cabin display devices; and flight instruments.

07 Aircraft Propulsion and Power N.A.

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08 Aircraft Stability and Control N.A.

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

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11 Chemistry and Materials 14

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
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6. Report Number(s); Availability and Price Codes
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AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 378)

JULY 10, 1998

01 AERONAUTICS

19980137407 Logistics Management Inst., McLean, VA USA

The Aviation System Analysis Capability Airport Capacity and Delay Models ***Final Report***

Lee, David A., Logistics Management Inst., USA; Nelson, Caroline, Logistics Management Inst., USA; Shapiro, Gerald, Logistics Management Inst., USA; Apr. 1998; 78p; In English

Contract(s)/Grant(s): NAS2-14361; RTOP 538-04-14-02

Report No.(s): NASA/CR-1998-207659; NAS 1.26:207659; LMI-NS603S1; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The ASAC Airport Capacity Model and the ASAC Airport Delay Model support analyses of technologies addressing airport capacity. NASA's Aviation System Analysis Capability (ASAC) Airport Capacity Model estimates the capacity of an airport as a function of weather, Federal Aviation Administration (FAA) procedures, traffic characteristics, and the level of technology available. Airport capacity is presented as a Pareto frontier of arrivals per hour versus departures per hour. The ASAC Airport Delay Model allows the user to estimate the minutes of arrival delay for an airport, given its (weather dependent) capacity. Historical weather observations and demand patterns are provided by ASAC as inputs to the delay model. The ASAC economic models can translate a reduction in delay minutes into benefit dollars.

Author

Airports; Air Transportation; Systems Analysis; Weather; Air Traffic

19980137409 Logistics Management Inst., McLean, VA USA

A Method for Evaluating the Safety Impacts of Air Traffic Automation ***Final Report***

Kostiuk, Peter, Logistics Management Inst., USA; Shapiro, Gerald, Logistics Management Inst., USA; Hanson, Dave, Draper (Charles Stark) Lab., Inc., USA; Kolitz, Stephan, Draper (Charles Stark) Lab., Inc., USA; Leong, Frank, Draper (Charles Stark) Lab., Inc., USA; Rosch, Gene, Draper (Charles Stark) Lab., Inc., USA; Bonesteel, Charles, CHAVA Group, USA; May 1998; 74p; In English

Contract(s)/Grant(s): NAS2-14361; RTOP 538-08-11-01

Report No.(s): NASA/CR-1998-207673; NAS 1.26:207673; LMI-NS711S1; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes a methodology for analyzing the safety and operational impacts of emerging air traffic technologies. The approach integrates traditional reliability models of the system infrastructure with models that analyze the environment within which the system operates, and models of how the system responds to different scenarios. Products of the analysis include safety measures such as predicted incident rates, predicted accident statistics, and false alarm rates; and operational availability data. The report demonstrates the methodology with an analysis of the operation of the Center-TRACON Automation System at Dallas-Fort Worth International Airport.

Author

Aircraft Safety; Reliability Analysis; Air Traffic; Automatic Control

02
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

19980073279 NASA Langley Research Center, Hampton, VA USA
The LaRC Wake Vortex Modelling Effort
Proctor, Fred, NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 75-92; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The purpose of the modelling effort at NASA Langley, including goals, is outlined in this presentation. Included, is a description of the numerical model that is used for the NASA wake vortex modeling effort and the approach that is taken in order to achieve the stated goals. Also shown are: 1) a demonstration of using the model in a fog environment; 2) preliminary results from a 3-D simulation in a nonturbulent and thermally-stable environment with comparison to a comparable 2-D simulation of the same event; and 3) several validation cases from the Idaho-Falls and Memphis field studies where results from the 2-D version of the model are compared with Lidar and tower data.
Author
Turbulence Models; Vortices; Computerized Simulation; Aircraft Wakes; Three Dimensional Models; Atmospheric Models

19980073280 NASA Langley Research Center, Hampton, VA USA
Two Dimensional Parametric Studies of Wake Vortex Interaction with the Atmosphere
Proctor, Fred, NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 93-108; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Results from parametric runs using two-dimensional TASS are presented. First, a set of experiments are presented that examine the sensitivity of the aircraft initiation height for an ”in ground effect” case with weak crosswind. Interaction between the ground and the wake vortex produces an oscillatory rebound whose phase and amplitude are a function of the generation height. A second set of experiments are presented which examine the influence on crosswind shear. Shear layers, such as may be found between the nocturnal stable layer and the residual layer, can act to deflect vortices upward. Further investigation reveals that the second derivative of the crosswind can differentially reduce the descent speed of each member of a vortex pair, causing tilting of the vortex pair. If sufficiently large, the second derivative of crosswind can deflect the vortex pair upwards, with the sign of the second derivative determining which of the two vortices rises to a higher altitude. Linear shear, on the other hand, caused no change in the descent speed of the vortices; thus having no effect on the orientation of the vortices. Observed and model data from an actual case are presented in support of the conclusion regarding the influence of shear on rising vortices.
Author
Aircraft Wakes; Shear Layers; Wind Shear; Ground Effect (Aerodynamics); Computerized Simulation; Wing Tip Vortices; Turbulence Models

19980073281 North Carolina State Univ., Dept. of Marine, Earth and Atmospheric Science, Raleigh, NC USA
Toward Understanding Wake Vortices and Atmospheric Turbulence Interactions Using Large-Eddy Simulation
DeCroix, David, North Carolina State Univ., USA; Lin, Yuh-Lang, North Carolina State Univ., USA; Arya, S. Pal, North Carolina State Univ., USA; Kao, C.-T., North Carolina State Univ., USA; Shen, S., North Carolina State Univ., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 109-130; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The vortices produced by an aircraft in flight are a complex phenomena created from a ’sheet of vorticity’ leaving the trailing edge of the aircraft surfaces. This sheet tends to roll-up into two counter-rotating vortices. After a few spans downstream of the aircraft, the roll-up process is complete and the vortex pair may be characterized in a simple manner for modeling purposes. Our research will focus on what happens to these post roll-up vortices in the vicinity of an airport terminal. As the aircraft wake vortices descend, they are transported by the air mass which they are embedded and are decayed by both internal and external processes. In the vicinity of the airport, these external influences are usually due to planetary boundary layer (PBL) turbulence. Using large-eddy simulation (LES), one may simulate a variety of PBL conditions. In the LES method, turbulence is generated in the PBL as a response to surface heat flux, horizontal pressure gradient, wind shear, and/or stratification, and may produce convective or unstably stratified, neutral, or stably stratified PBL’s. Each of these PBL types can occur during a typical diurnal cycle of the PBL. Thus it is important to be able to characterize these conditions with the LES method. Once this turbulent environment has been generated, a vortex pair will be introduced and the interactions are observed. The objective is to be able to quantify the PBL turbu-

lence vortex interaction and be able to draw some conclusions of vortex behavior from the various scale interactions. This research is ongoing, and we will focus on what has been accomplished to date and the future direction of this research. We will discuss the model being used, show results that validate its use in the PBL, and present a nested-grid method proposed to analyze the entire PBL and vortex pair simultaneously.
Author
Planetary Boundary Layer; Turbulent Boundary Layer; Vortices; Aircraft Wakes; Atmospheric Turbulence; Large Eddy Simulation; Turbulence Models

19980073282 North Carolina State Univ., Dept. of Marine, Earth and Atmospheric Science, Raleigh, NC USA
Large Eddy Simulation of Aircraft Wake Vortices: Atmospheric Turbulence Effects
Han, Jongil, North Carolina State Univ., USA; Lin, Yuh-Lang, North Carolina State Univ., USA; Arya, S. Pal, North Carolina State Univ., USA; Kao, C.-T., North Carolina State Univ., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 131-144; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Crow instability can develop in most atmospheric turbulence levels, however, the ring vortices may not form in extremely strong turbulence cases due to strong dissipation of the vortices. It appears that strong turbulence tends to accelerate the occurrences of Crow instability. The wavelength of the most unstable mode is estimated to be about 5b(sub 0), which is less than the theoretical value of 8.6b(sub 0) (Crow, 1970) and may be due to limited domain size and highly nonlinear turbulent flow characteristics. Three-dimensional turbulence can decay wake vortices more rapidly. Axial velocity may be developed by vertical distortion of a vortex pair due to Crow instability or large turbulent eddy motion. More experiments with various non-dimensional turbulence levels are necessary to get useful statistics of wake vortex behavior due to turbulence. Need to investigate larger turbulence length scale effects by enlarging domain size or using grid nesting.
Derived from text
Vortices; Aircraft Wakes; Large Eddy Simulation; Turbulence Effects; Atmospheric Turbulence; Turbulence Models

19980073283 Centre Europeen Recherche et de Formation Advance en Calcul Scientific, Toulouse, France
Large Eddy Simulations of Rebound and Aging of Three-Dimensional Wake Vortices Within the Atmospheric Boundary Layer
Corjon, Alexandre, Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Darracq, Denis, Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Decros, Frederic, Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 145-168; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Included in the presentation are details of the MFLAME Project, real test cases, including Idaho Falls experimental data, idealized test cases- concentrating on aging due to turbulence, ground effect with 3D wind, and Crow instability near the ground-theoretical modelling, lidar simulation and concluding remarks.
CASI
Atmospheric Boundary Layer; Ground Effect (Aerodynamics); Large Eddy Simulation; Turbulence Effects; Vortices; Aircraft Wakes; Turbulence Models

19980073284 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. of Atmospheric Physics, Wessling, Germany
Aircraft Wake Vortices in the Atmosphere
Gerz, Thomas, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Holzaepfel, Frank, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 169-184; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

By means of large-eddy simulations dynamics are discussed which control the decay of the wake vortices of a subsonic aircraft under cruising conditions. The period between 1s and several minutes of wake age is considered. The method is briefly introduced. Emphasis is put on the effect of turbulence on the decay process of the wingtip vortices; thereby it is distinguished between background atmospheric turbulence and turbulence stemming from the boundary layer of the aircraft. to introduce ongoing work at the Institute of Atmospheric Physics related to the current topic, some results of wake vortices measured during flight campaigns as well as results of large eddy simulations of the convective atmospheric boundary layer are presented.
Author
Aircraft Wakes; Atmospheric Boundary Layer; Atmospheric Turbulence; Large Eddy Simulation; Wing Tip Vortices; Turbulence Models

19980073285 Northwest Research Associates, Inc., Bellevue, WA USA
Effects of Statification on 3-D Trailing Vortex Evolution
Robins, Robert E., Northwest Research Associates, Inc., USA; Delisi, Donald P., Northwest Research Associates, Inc., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 185-201; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Two studies are presented. First, the effects of stratification on Crow instability are examined numerically. Results from calculations for Froude number, F, equal to 2, 4, and 8, are shown at non-dimensional times of 4, 6, 8, and 10. Stratification is seen to accelerate the onset of linking due to Crow instability and to suppress the downward migration of the vortices. It is also seen that for low stratification, such that F greater than approx. 8, Crow instability results in the formation of downward propagating vortex rings. For higher stratification, such that F less than approx. 4, the ring formation is suppressed. In a second study, laboratory and numerical results, in good agreement, show the occurrence of a small-scale instability for strong stratification, such that F less than approx. 2. These results may be relevant to airport operations because of the possibility that stratification effects and small-scale instabilities may result in trailing vortices remaining near the flight path of following aircraft.
Author
Flow Stability; Vortices; Atmospheric Stratification; Turbulence Models; Aircraft Wakes; Computerized Simulation

19980073286 University of South Alabama, Dept. of Mechanical Engineering, Mobile, AL USA
Initialization and Computation of 3-D Wake Vortices
Zheng, Zhong-Quan Charlie, University of South Alabama, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 202-211; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The following topics are included in the presentation: (1) Axial velocity effects on 3-D vortices; (2) Initial 3-D computational simulation with axial flow; and (3) The Zonal computational method. Conclusions include: (1) Initial axial velocity profiles influence the 3-D vortex decay behavior; (2) Axial velocity deviation can change the effects of vortex core growth on total circulation, axial vorticity and maximum tangential velocity; (3) Computational results are in agreement with the trend predicted in the analytical study; and (4) The zonal method can be utilized to extend far downstream 3-D simulation.
Derived from text
Axial Flow; Vortices; Aircraft Wakes; Computerized Simulation

19980073289 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Wake Vortex Measurements with a CW 10.6 Micron Coherent Laser Radar
Heinrichs, Richard M., Massachusetts Inst. of Tech., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 235-246; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

CW coherent laser radar provides detailed vortex measurements at ranges less than or equal to 400 m. Lincoln Laboratory has collected simultaneous wake vortex and meteorological data at Memphis for validation of vortex behavior models. Vortex range estimated from angular integral of velocity spectra versus velocity; Results compare well with windline data. Vortex circulation estimated from spectral maximum velocities: Circulations (especially of smaller aircraft) can be biased due to flow from neighboring vortex; Results agree well with theory when bias is considered.
Derived from text
Flow Measurement; Optical Radar; Coherent Radar; Aircraft Wakes; Vortices

19980073290 NASA Langley Research Center, Hampton, VA USA
Wake Vortex Lidar System: Overview of LaRC Pulsed Lidar Measurements
Brockman, Philip, NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 247-260; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

In the overview, a description of the LaRC trailer facility, lasers and transceivers, scanners, data systems and deployment are presented.
CASI
Optical Radar; Aircraft Wakes; Vortices; Optical Scanners

19980073292 Research Triangle Inst., Hampton, VA USA

Estimation of Vortex Characteristics from Coherent Lidar Measurements

Britt, Charles L., Research Triangle Inst., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 280-291; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

In the work a mathematical framework is developed and real-time operation is achieved. Long lidar pulse causes resolution problems, max. and min. velocities appear to be the best measurements to use with long pulse, and high lidar SNR is necessary with long pulse. More work needs to be done, including getting data from heavy aircraft, and using data to develop better measurement models. The current tracking reliability needs improvement and the accuracy must be determined.

CASI

Vortices; Radar Measurement; Optical Radar; Aircraft Wakes; Detection

19980073293 NASA Langley Research Center, Hampton, VA USA

A 1000 Hz Pulsed Solid-State Raman Laser for Coherent Lidar Measurement of Wake Vortices

Koch, Grady J., NASA Langley Research Center, USA; Murray, James, Lite Cycles, Inc., USA; Lytle, Carroll, NYMA, Inc., USA; Nguyen, Chi, Research Triangle Inst., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 292-298; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Included in the overview is a discussion of the 1.5 micron laser specifications, eye safety and cost, scan rates, pulselength, range capability issues, Raman beam cleanup, receiver layout, and the real-time processor and display.

CASI

Solid State Lasers; Vortices; Aircraft Wakes; Raman Lasers; Radar Measurement; Pulsed Lasers

19980073295 Research Triangle Inst., Center for Aerospace Technology, Hampton, VA USA

Wake Vortex Radar Simulation Studies

Marshall, Robert E., Research Triangle Inst., USA; Mudukutore, Ashok, Research Triangle Inst., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 309-323; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Wake vortex radar reflectivity models in clear air and fog; and 35 GHz Wake Vortex pulse compression radar simulations in fog are presented.

CASI

Mathematical Models; Computerized Simulation; Aircraft Wakes; Vortices

19980073296 NASA Langley Research Center, Hampton, VA USA

Wake Sensor Evaluation Program and Results of JFK-1 Wake Vortex Sensor Intercomparisons

Barker, Ben C., Jr., NASA Langley Research Center, USA; Burnham, David C., Scientific and Engineering Solutions, Inc., USA; Rudis, Robert P., Federal Aviation Administration, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 324-332; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The overall approach should be to: (1) Seek simplest, sufficiently robust, integrated ground based sensor systems (wakes and weather) for AVOSS; (2) Expand all sensor performance cross-comparisons and data mergings in on-going field deployments; and (3) Achieve maximal cost effectiveness through hardware/info sharing. An effective team is in place to accomplish the above tasks.

Derived from text

Aircraft Wakes; Vortices; Detection; Optical Radar; Radar Measurement

19980073297 Scientific and Engineering Solutions, Inc., Orleans, MA USA

JFK-1 Wake Vortex Sensor Intercomparisons

Burnham, David C., Scientific and Engineering Solutions, Inc., USA; Rudis, Robert P., Federal Aviation Administration, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 333-341; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Comparisons and status of several wake vortex sensors are presented. The sensors include the Volpe Anemometer Array, MIT/LL CW Lidar, WLR RASS and the Wake Vortex Sodar.

CASI

Anemometers; Optical Radar; Sodar

19980073298 NASA Langley Research Center, Hampton, VA USA

Current Status and Application of Hazard Definition Technology

Greene, George C., NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 342-350; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

A research is performed: to define wake non-encounter & hazard, to provide requirements for sensors, and to obtain input from the user community. This research includes: validating wake encounter simulation models, establishing a metric to quantify the upset potential of a wake encounter, applying hazard metric and simulation models to the commercial fleet for development of candidate acceptable encounter limits, and applying technology to near term problems to evaluate current status of technology. The following lessons are learned from this project: technology is not adequate to determine absolute spacing requirements; time, not distance, determines the duration of the wake hazard; Optimum standards depend on the traffic; Wing span is an important parameter for characterizing both generator and follower; and Short span ”biz jets” are easily rolled.

CASI

Aircraft Wakes; Vortices; Flight Hazards; Flow Distortion; Vortex Alleviation

19980073303 Quebec Univ., Dept. of Earth Sciences, Montreal, Quebec Canada

Providing Meteorological Support to AVOSS: The COBEL 1D Model

Zwack, Peter, Quebec Univ., Canada; Tardif, Robert, Quebec Univ., Canada; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 414-429; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

COBEL prototype developed at laboratoire d’aerologie, Universite Paul Sabatier, Toulouse, France. It used to study the formation of radiation fog. This paper discusses the COBEL 1D model. It contains the following sections: Introduction, One-Dimensional Modeling Strategy, Overview of COBEL, COBEL Configuration for DFW, Validation Efforts, and Perspectives.

CASI

Fog; Atmospheric Models; Meteorological Parameters; Numerical Weather Forecasting; Meteorology

19980096401 Osaka City Univ., Dept. of Architecture and Building Engineering, Japan

Experimental Study and Analysis on the Fluttering of a Membrane Suspended in a Uniform Air Flow, Part 1, Experimental Investigation on the Behavior and the Bearing Force of Membrane Fluttering

Minami, Hirokazu, Osaka City Univ., Japan; Okuda, Yasuo, Osaka City Univ., Japan; Kawamura, Sumio, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering: Osaka City University; Dec. 1994; ISSN 0078-6659; Volume 35, pp. 65-76; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Three types of fabric specimens took three stable conditions when the specimens were suspended with a sag between the leeward and windward supporting bars and were subjected to a uniform air flow in a wind tunnel. The three stable conditions were of a concave, convex and a fluttering configuration. In the fluttering condition, the specimens showed linear relations between the flow speed and the frequency. T(sub x), which is the horizontal bearing force per unit width of the specimen at the leading edge took a smaller or larger value in response to the three stable conditions. On the concave and convex conditions, the values of T(sub x) increased proportionally roughly to the square of the air flow speed, and these values were larger than those in the fluttering condition. In the fluttering condition, T(sub x) showed a larger value, T(sub xma), which was the maximum impulse value in each period of the fluttering oscillation. However, the T(sub xma) of the heaviest specimen showed an approximate magnitude to T(sub x) during concave and convex conditions.

Author

Wind Tunnel Tests; Uniform Flow; Membranes; Fabrics; Flutter; Force Distribution

19980096402 Osaka City Univ., Dept. of Architecture and Building Engineering, Japan

Experimental Study and Analysis on the Fluttering of a Membrane Suspended in a Uniform Air Flow, Part 2, An Approximate Analysis Method on Flutterring

Minami, Hirokazu, Osaka City Univ., Japan; Okuda, Yasuo, Osaka City Univ., Japan; Kawamura, Sumio, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering: Osaka City University; Dec. 1994; ISSN 0078-6659; Volume 35, pp. 77-88; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The membrane specimens, consisting of a PTFE-coated glass fiber fabric and three other kinds of fabric, were each suspended in a uniform air flow in side a wind tunnel with a sag between the windward and the leeward supports. Flutter occurred with a simple wave configuration at a critical air flow speed which was the minimum speed at which the fluttering could occur. The property of the wave configuration of this fluttering has been described in Part I of this article. The subsequent research into a method

for approximate analysis on the fluttering membrane is presented and described in this paper. The fluttering membrane is modeled as a sinusoidal travelling wave, and is analyzed by the approximate method of applying the thin-airfoil theory and Hamilton's principle. The tensile stress in the membrane is assumed to be constant and steady, and the amplitude of the flutter oscillation is considered to be finite. Therefore, the problem in this analysis method is a nonlinear problem. In other words, we can't solve uniquely the frequency of the oscillation and the amplitude at an air flow speed given. Through this analysis the period-membrane stress response curves at each flow speed could be calculated. Studies of these curves produced a rough coincidence between the analytical and the experimental results, confirming an air flow speed-frequency relation.
Author
Uniform Flow; Thin Airfoils; Membranes; Fabrics; Glass Fibers; Polytetrafluoroethylene; Flutter Analysis; Wind Tunnel Tests

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

19980073273 NASA Langley Research Center, Hampton, VA USA
Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop
Creduer, Leonard, Editor, NASA Langley Research Center, USA; Perry, R. Brad, Editor, NASA Langley Research Center, USA; Nov. 1997; 626p; In English; 1st; NASA Wake Vortex Dynamic Spacing Workshop, 13-15 May 1997, Hampton, VA, USA; Also announced as 19980073274 through 19980073313
Contract(s)/Grant(s): RTOP 538-04-11-17
Report No.(s): NASA/CP-97-206235; L-17676; NAS 1.55:206235; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

A Government and Industry workshop on wake vortex dynamic spacing systems was conducted on May 13-15, 1997, at the NASA Langley Research Center. The purpose of the workshop was to disclose the status of ongoing NASA wake vortex R&D to the international community and to seek feedback on the direction of future work to assure an optimized research approach. Workshop sessions examined wake vortex characterization and physics, wake sensor technologies, aircraft/wake encounters, terminal area weather characterization and prediction, and wake vortex systems integration and implementation. A final workshop session surveyed the Government and Industry perspectives on the NASA research underway and related international wake vortex activities. This document contains the proceedings of the workshop including the presenters' slides, the discussion following each presentation, the wrap-up panel discussion, and the attendees' evaluation feedback.
Author
Conferences; Aircraft Wakes; Vortices; Vortex Advisory System

19980073274 NASA Langley Research Center, Hampton, VA USA
Aircraft Vortex Spacing System (AVOSS) Concept and Development
Hinton, David A., NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 11-22; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The AVOSS goal is to: (1) Support TAP goal of improving instrument operations capacity 12-15% while maintaining safety; (2) Provide dynamical aircraft wake vortex spacing criteria to ATC systems at capacity limited facilities with required lead time and stability for use in establishing aircraft arrival scheduling; and (3) System development and concept demonstration. The AVOSS system concept is to separate aircraft from encounters with wake vortices of an operationally unacceptable strength. In doing so, define protected corridor from outer marker to runway and predict time for vortex to clear ("Transport Time"), define operationally unacceptable wake strength and predict time to decay ("Decay Time"), combine and provide to ATC automation ("Residence Time"), and monitor safety and provide predictor feedback with wake vortex detection subsystem.
Derived from text
Air Traffic Control; Aircraft Approach Spacing; Aircraft Wakes

19980073275 NASA Langley Research Center, Hampton, VA USA
History of Wake Vortex Research: Problems and Accomplishments
Greene, George C., NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 23-32; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Significant progress has been made in understanding vortex behavior but much remains to be done. The primary challenge is to bring ”science” into operational use. Success will require cooperation from a diverse group of organizations.
Derived from text
Vortices; Histories; Aircraft Wakes

19980073276 Boeing Commercial Airplane Co., Seattle, WA USA
Wake-Vortex Physics: The Great Controversies
Spalart, Philippe, Boeing Commercial Airplane Co., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 33-44; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The following questions are addressed in the report: Do vortices decay?; Why does ATC work today?; Do wakes ever rise?; What is the effect of stable atmospheric stratification?; Are the vortices bathing in turbulence?; How much can happen to ONE vortex?; and passive or active control strategy? Ground rules: I tried to clearly summarize conflicting opinions. They may appear extreme, but I believe each is held by serious people in the field.
Derived from text
Vortices; Aircraft Wakes; Atmospheric Turbulence

19980073277 Federal Aviation Administration, Volpe National Transportation Systems Center, Cambridge, MA USA
Past Wake Vortex Investigations and Dynamic Spacing Systems
Spitzer, Edward A., Federal Aviation Administration, USA; Hallock, James N., Federal Aviation Administration, USA; Burnham, David C., Scientific and Engineering Solutions, Inc., USA; Rudis, Robert P., Federal Aviation Administration, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 45-60; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

A history is given of the past research concerning wake vortex and dynamic spacing systems. Current research and vortex physics, safety and hazard definition are also presented.
CASI
Aircraft Wakes; Vortices; Aircraft Approach Spacing

19980073278 Naval Postgraduate School, Mechanical Engineering, Monterey, CA USA
Decay of Wake Vortices of Large Aircraft
Sarpkaya, Turgut, Naval Postgraduate School, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 61-74; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

A finite wing has three vortices: bound vortex, starting vortex, and the trailing vortex. It is primarily the trailing vortex/wake that can be very hazardous to following aircraft during cruise and especially during take-off and landing. This, in turn, gives rise to complex air-traffic-control and aircraft-handling problems. The safe longitudinal separation distance between consecutive aircraft is in part determined by the time interval the vortices require to decay and dissipate, or to breakup due to the onset of catastrophic instabilities (vortex linking or burst), or to be convected out of the flight path of the following aircraft by the combined action of their self induced velocity and wind. These processes are strongly influenced by the meteorological conditions such as ambient turbulence, wind shear, stratification, humidity and precipitation which can considerably effect the lifetime of the trailing vortices. The elimination or the reduction of the intensity of trailing vortices has the added advantages of reducing drag and increasing the aerodynamic efficiency of the wing. For an aircraft in landing configuration, extended flaps will result in variations in the spanwise circulation distribution, which will result in a multi-vortex wake topology. The proximity of the ground, cross winds, ground heating, etc. have profound effects on the development of this already complex problem. Suffice it to note that, vortex decay in the atmosphere in cruising conditions is significantly different from that in landing/takeoff conditions. Near the ground, the vortices strongly interact with the ground boundary layer, may acquire non-circular cross-sections, cause flow separation on the ground, give rise to oppositely-signed vorticity (with additional ground-vortex images) and rebounding (by forming a vortex dipole between the heterostrophic and homostrophic vortices). Clearly, the determination of a safe aircraft separation is a very difficult problem and requires careful measurements in the field, meteorological data, and the reliable evaluation and interpretation of the results. The uniqueness of the problem comes not so much from the strong interaction between a man-made structure and the environment (normally, a bluff body problem), but rather from the interaction of the byproducts of this interaction with other bodies in a partially altered environment. It is also unique among the many complex and industrially challenging aero-

dynamics problems in the sense that the answer lies within a surprisingly small range of numbers (three to ten miles!), depending on who is following the leading aircraft.
Author
Aircraft Approach Spacing; Vortex Breakdown; Vortex Alleviation; Wing Tip Vortices; Aircraft Wakes

19980073287 Research Triangle Inst., Research Triangle Park, NC USA
Two-Dimensional Simulation of Wake Vortex Interaction From Multiple Aircraft
Switzer, George, Research Triangle Inst., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 212-222; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This numerical experiment investigates the significance of wake interaction from multiple aircraft in the region of the runway threshold. The study is chosen from the 1995 Memphis observations of cases 1493 to 1496 because of close spacing and varied strengths of the wake vortex systems. The observed environmental input conditions are of weak crosswinds winds with a mean value of 1 m/s. The model vortex systems are injected at times and altitudes corresponding to that of the actual aircraft. A video of potential temperature and vorticity shows the dynamics of the vortex interaction. The observations from the video are that vortex movement may change direction from downwind to upwind due to influence of other vortex systems and vortices from different aircraft may couple to produce new vortex systems. However, the interaction from multiple vortex systems did not create significant departures from what was predicted with an isolated vortex system. Finally the trajectory of altitude and lateral position is compared for Memphis case 1494 and 1496 showing good agreement.
Author
Aircraft Wakes; Vortices; Two Dimensional Models; Computerized Simulation; Atmospheric Turbulence

19980073288 NASA Langley Research Center, Hampton, VA USA
Wake Vortex Sensors Requirements Overview
Hinton, David A., NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 228-234; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The presentation includes discussions of primary wake vortex system requirements, evolution models, sensor evolution, site specific sensor tradeoffs, wake sensor functions, deployment considerations, the operational test bed system and additional sensor requirements.
CASI
Vortices; Aircraft Wakes; Flow Measurement; Vortex Avoidance

19980073291 Coherent Technologies, Inc., Lafayette, CO USA
Pulsed Coherent Lidar Wake Vortex Detection, Tracking and Strength Estimation in Support of AVOSS
Hannon, Stephen M., Coherent Technologies, Inc., USA; Phillips, Mark W., Coherent Technologies, Inc., USA; Thomson, J. Alex, Coherent Technologies, Inc., USA; Henderson, Sammy W., Coherent Technologies, Inc., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 261-279; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

In the overview the technological background, Phase II SBIR development efforts, including the transceiver and real time signal processor, real-time vortex algorithm overview, validation efforts including the Air Force Program: C-5, C-17, C-141, C-130, and Norfolk Airport: 727, 737, F-100, DC-9, DASH-8 and a summary and prognosis, including the dedicated vortex measurements and local environment assessment are presented.
CASI
Optical Radar; Aircraft Wakes; Vortices; Detection

19980073299 NASA Langley Research Center, Hampton, VA USA
Piloted Simulation Study of Wake Encounters
Stewart, Eric, NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 351-370; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The objective of this current research is to determine an acceptable level of vortex roll disturbance for worst-case encounter geometries during normal, routine operations. This includes: determining the boundary & metric(s), and defining evaluation fac-

tors & procedures. The discussion includes: simulation hardware, research simulator software, and research approach & observations.
CASI
Vortices; Aircraft Wakes; Simulation; Flow Stability; Vortex Alleviation; Roll; Aircraft Pilots

19980073300 NASA Langley Research Center, Hampton, VA USA
Wake Vortex Encounter Model Validation Experiments
Vicroy, Dan, NASA Langley Research Center, USA; Brandon, Jay, NASA Langley Research Center, USA; Greene, George C., NASA Langley Research Center, USA; Rivers, Robert, NASA Langley Research Center, USA; Shah, Gautam, NASA Langley Research Center, USA; Stewart, Eric, NASA Langley Research Center, USA; Stuever, Robert, NASA Langley Research Center, USA; Rossow, Vernon, NASA Ames Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 371-383; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The goal of this current research is to establish a database that validate/calibrate wake encounter analysis methods for fleet-wide application; and measure/document atmospheric effects on wake decay. Two kinds of experiments, wind tunnel experiments and flight experiments, are performed. This paper discusses the different types of tests and compares their wake velocity measurement.
CASI
Vortices; Aircraft Wakes; Wind Tunnel Tests; Flight Tests; Calibrating; Mathematical Models; Atmospheric Effects

19980073305 NASA Langley Research Center, Hampton, VA USA
AVOSS Development Approach
Hinton, David A., NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 460-468; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

A concept is presented for development and implementation of prototype Aircraft Vortex Spacing System (AVOSS). The purpose of the AVOSS is to provide dynamical, weather dependent wake vortex separation criteria to ATC facilities with adequate stability and lead time for use in establishing arrival scheduling. This current paper discusses AVOSS development approach. The discussion includes: system model, AVOSS R&D effort scope, major development issues, concept system development process, AVOSS system testing, and concept demonstration.
CASI
Systems Engineering; Aircraft Wakes; Weather Forecasting; Vortices

19980073308 NASA Ames Research Center, Moffett Field, CA USA
Terminal Area Productivity Program: Dynamic Spacing Human Factors
Kanki, Barbara G., NASA Ames Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 500-508; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Dynamic spacing human factors deals with the following human factors issues: define controller limits to incorporating dynamic changes in separation standards; identify timing, planning, and coordination strategies; and consider consistency with current practices, policies, and regulations. The AVOSS technologies will make it possible to reduce separation standards in the terminal area under certain meteorological conditions. This paper contains the following sections: Dynamic space human factors overview, Preliminary tests, and current research status & plans.
CASI
Human Factors Engineering; Air Traffic Control; Air Traffic Controllers (Personnel)

19980073309 NASA Langley Research Center, Hampton, VA USA
Wake Vortex Systems Cost/Benefits Analysis
Crisp, Vicki K., NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 509-519; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The goals of cost/benefit assessments are to provide quantitative and qualitative data to aid in the decision-making process. Benefits derived from increased throughput (or decreased delays) used to balance life-cycle costs. Packaging technologies together may provide greater gains (demonstrate higher return on investment).
Derived from text
Cost Analysis; Cost Effectiveness; NASA Programs; Project Management

19980073310 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Getting to Operational Deployment: Lessons from TDWR and ITWS
Evans, James E., Massachusetts Inst. of Tech., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 520-532; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The FAA acquisition process, issues in development of "wake vortex" like systems, development strategy, and lessons learned are presented. AVOSS has a number of similarities to FAA weather system development. Namely, weather/atmosphere being a key factor, new ATC capability and "concurrent" system development (e.g., ITWS, CTAS). AVOSS needs to get entrained into the FAA acquisition process at some point. The mission needs a statement and operational requirements. Prototypes used operationally can be very helpful. These can clarify user needs, quantify and improve benefits, build operational user support and reduce schedule and risk.
Derived from text
Deployment; Prototypes; Systems Engineering; Industrial Management; Strategy; Civil Aviation

19980073311 Flugwissenschaftliche Forschungsanstalt, Munich, Germany
The Wake Vortices Warning System (WVWS) for Frankfurt Airport Parallel Runway System 25
Rankenburg, Joerg, Flugwissenschaftliche Forschungsanstalt, Germany; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 537-548; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The WVWS objective is to reduce/suspend increased wake vortex separation minima between staggered aircraft on final approach to the two parallel runways 25 at Frankfurt airport in order to increase arrival capacity whilst maintaining or increasing safety. Aircraft approaching the same runway will continue to be separated according to the increased (ICAO) wake vortex separation minima. Issues and analysis supporting this objective are presented.
Derived from text
Airports; Air Traffic Control; Aircraft Approach Spacing; Warning Systems; Runways; Collision Avoidance

19980073312 Transport Canada, Airspace Standards and Procedures, Ottawa, Ontario Canada
Vortex Forecasting System
Rennick, Sydney, Transport Canada, Canada; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 549-570; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The perspectives, assumptions, types of operation, time frame, and recommendations concerning the vortex forecasting system of the Transport Canada, Airspace Standards and Procedures protocol are presented.
CASI
Forecasting; Aircraft Safety; Aircraft Wakes; Wing Tip Vortices; Mathematical Models; Computerized Simulation

19980073313 Meteorological Office, Forecasting Products, Bracknell, UK
Development of a Wake Vortex Incident Reporting System and Database
Turner, Julie, Meteorological Office, UK; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 571-581; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

It was recently identified that wake vortex separation regulations where an increasing limitation on capacity at European airports. Studies showed that with sufficient incident data, the potential to decrease separations under favorable meteorological conditions could be realized. The European Commission has recently contracted the UK Met. Office and aviation telematics specialists RED Scientific Ltd. to develop and implement a Europe-wide wake vortex incident reporting system, utilizing both automatic and human data sources. The aim is to create and maintain a database of wake vortex incident reports with associated

meteorological data, which may then be used by researchers and operational aviation community to further understand wake vortex behavior. This presentation will summarize the motivation, aims and future uses of the reporting log, and is an opportunity for potential users or contributors to discuss their thoughts and requirements for the use of the database products both in Europe and the US.
Author
Data Bases; Europe; Reports; Data Acquisition; Data Integration; Aircraft Wakes; Wing Tip Vortices; Atmospheric Turbulence

19980107922 Georgia Inst. of Tech., Atlanta, GA USA
Demonstration of a Probabilistic Technique for the Determination of Economic Viability of Very Large Transport Configurations ***Final Report No. 3, 31 Mar. 1997 - 31 Mar. 1998***
Mavris, Dimitri N., Georgia Inst. of Tech., USA; Mar. 31, 1998; 59p; In English
Contract(s)/Grant(s): NAG-1-1662
Report No.(s): NASA/CR-1998-207762; NAS 1.26:207762; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Over the past few years, modem aircraft design has experienced a paradigm shift from designing for performance to designing for affordability. This report contains a probabilistic approach that will allow traditional deterministic design methods to be extended to account for disciplinary, economic, and technological uncertainty. The probabilistic approach was facilitated by the Fast Probability Integration (FPI) technique; a technique which allows the designer to gather valuable information about the vehicle's behavior in the design space. This technique is efficient for assessing multi-attribute, multi-constraint problems in a more realistic fashion. For implementation purposes, this technique is applied to illustrate how both economic and technological uncertainty associated with a Very Large Transport aircraft concept may be assessed. The assessment is evaluated with the FPI technique to determine the cumulative probability distributions of the design space, as bound by economic objectives and performance constraints. These distributions were compared to established targets for a comparable large capacity aircraft, similar in size to the Boeing 747-400. The conventional baseline configuration design space was determined to be unfeasible and marginally viable, motivating the infusion of advanced technologies, including reductions in drag, specific fuel consumption, wing weight, and Research, Development, Testing, and Evaluation costs. The resulting system design space was qualitatively assessed with technology metric "k" factors. The infusion of technologies shifted the VLT design into regions of feasibility and greater viability. The study also demonstrated a method and relationship by which the impact of new technologies may be assessed in a more system focused approach.
Author
Transport Aircraft; Probability Theory; Design Analysis; Systems Engineering; Aircraft Design

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

19980111101 Civil Aeromedical Inst., Oklahoma City, OK USA
GPS Design Considerations: Displaying Nearest Airport Information ***Final Report***
Williams, Kevin W., Civil Aeromedical Inst., USA; Apr. 1998; 22p; In English
Report No.(s): DOT/FAA/AM-98/12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Thirty-six participants were tested in a flight simulator on their ability to orient toward the nearest airport, based on the manner in which information was presented on a global positioning system (GPS) display. Results indicated that use of the tabular, text-only format normally found on such displays was significantly slower and less accurate than either a map display of nearest airport information or a text display that included an orientation symbol. In addition, it was found that pilots tended to ignore information available from the heading indicator, and instead, focused solely on the GPS display to perform the task. Discussion of the results includes the need to support pilot decision-making through interface design and the development of design guidelines for GPS displays.
Author
Global Positioning System; Display Devices; Information Systems; Flight Simulators; Human-Computer Interface

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19980107884 NASA Ames Research Center, Moffett Field, CA USA

Validation of Vortex-Lattice Method for Loads on Wings in Lift-Generated Wakes

Rossow, Vernon J., NASA Ames Research Center, USA; Journal of Aircraft; Dec. 1995; Volume 32, No. 6, pp. 1254-1262; In English; 12th; Applied Aerodynamics Conference, 20-23 Jun. 1994, Colorado Springs, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA/TM-95-207379; NAS 1.15:207379; AIAA Paper 94-1839; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study is described that evaluates the accuracy of vortex-lattice methods when they are used to compute the loads induced on aircraft as they encounter lift-generated wakes. The evaluation is accomplished by the use of measurements made in the 80 by 120 ft Wind Tunnel of the lift, rolling moment, and downwash in the wake of three configurations of a model of a subsonic transport aircraft. The downwash measurements are used as input for a vortex-lattice code in order to compute the lift and rolling moment induced on wings that have a span of 0.186, 0.510, or 1.022 times the span of the wake-generating model. Comparison of the computed results with the measured lift and rolling-moment distributions the vortex-lattice method is very reliable as long as the span of the encountering or following wing is less than about 0.2 of the generator span. As the span of the following wing increases above 0.2, the vortex-lattice method continues to correctly predict the trends and nature of the induced loads, but it over-predicts the magnitude of the loads by increasing amounts.

Author

Vortex Lattice Method; Rolling Moments; Lift; Force Distribution; Subsonic Speed; Wind Tunnels; Loads (Forces)

19980111035 Mitre Corp., JASON Program Office, McLean, VA USA

Small Scale Propulsion: Fly on the Wall, Cockroach in the Corner, Rat in the Basement, Bird in the Sky

Eardley, D., Mitre Corp., USA; Katz, J., Mitre Corp., USA; Sep. 18, 1997; 34p; In English

Report No.(s): AD-A331212; JSR-97-135; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study concerns small vehicles on the battlefield, and in particular their propulsion. These vehicles may fly or travel on the ground by walking, rolling or hopping. Their purpose is to carry, generally covertly, a useful payload to a place inaccessible to man, or too dangerous for men, or in which a man or manned vehicle could not be covert. Small useful payloads usually are sensors, which may include visible or IR imagers, nonimaging photometers, detectors of lower frequency electromagnetic waves, detectors of various chemicals or ionizing radiation, seismic or acoustic sensors, meteorological instruments, etc., together with means of storing or communicating the results of their measurements back to the user. Useful payloads may also include taggants to be released, or lethal or non-lethal weapons; the restriction to very small payloads may still permit the delivery of effective weapons if the accuracy of delivery is high (possible examples include explosives applied to locks and irritant gases released in confined spaces). This field has been the subject of a great deal of speculation in the past. For example, many people have written about an artificial vehicle as small and inconspicuous as a fly or cockroach, which could fly or crawl into a denied area and transmit data. Unfortunately, an artificial fly or cockroach is far beyond present technology. It is possible to build vehicles as small as rats or small birds, but they are much less capable than the living organisms because of mechanical constraints.

DTIC

Meteorological Instruments; Electromagnetic Radiation; Communicating; Acoustics

19980137408 NASA Langley Research Center, Hampton, VA USA

Airbreathing Hypersonic Systems Focus at NASA Langley Research Center

Hunt, James L., NASA Langley Research Center, USA; Rausch, Vincent L., NASA Langley Research Center, USA; 1998; 18p; In English; 8th; International Space Planes and Hypersonic Systems and Technologies, 27-30 Apr. 1998, Norfolk, VA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): NASA/TM-1998-207982; NAS 1.15:207982; AIAA Paper 98-1641; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents the status of the airbreathing hypersonic airplane and space-access vehicle design matrix, reflects on the synergies and issues, and indicates the thrust of the effort to resolve the design matrix and to focus/advance systems technology

maturation. Priority is given to the design of the vision operational vehicles followed by flow-down requirements to flight demonstrator vehicles and their design for eventual consideration in the Future-X Program.
Author
Air Breathing Engines; Hypersonics; Hypersonic Aircraft

06
AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

19980137344 Naval Aerospace Medical Research Lab., Pensacola, FL USA
Background and Instrumentation for the Helicopter Instrument Scan Pattern Research Conducted at NAS Whiting Field
Temme, L. A., Naval Aerospace Medical Research Lab., USA; Still, D. L., Naval Aerospace Medical Research Lab., USA; Jun. 14, 1996; 19p; In English
Report No.(s): AD-A331227; NAMRL-TM-96-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Effectively scanning and interpreting flight instruments are crucially important skills for pilots. Despite the facts that much of pilot training is devoted to developing an effective scan and that virtually all successful pilots have effective scans, there is surprisingly little objective information about instrument scan patterns. Most studies of scan patterns have used either pilots' self reports of their scanning or measurements made with relatively invasive eye tracking procedures, procedures so invasive as to have likely affected the behavior they were intended to measure in the first place. Furthermore, almost all of these studies have been executed under laboratory conditions that were at best poor or low fidelity emulations of the aviation task. In order to fill these voids in the literature and to provide objective, fleet relevant information describing instrument scan patterns under realistic situations, NAMRL developed the capability of monitoring, in an essentially non-invasive fashion, the scanning behaviors of pilots as they fly the full sized, motion based, high fidelity, helicopter instrument training simulator at NAS Whiting Field. The present paper provides a photographic description of this research installation.
DTIC
Visual Perception; Pilot Training; Flight Instruments; Human Factors Engineering

11
CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

19980111019 NASA Langley Research Center, Hampton, VA USA
Response of Composite Fuselage Sandwich Side Panels Subjected to Internal Pressure and Axial Tension
Rouse, Marshall, NASA Langley Research Center, USA; Ambur, Damodar R., NASA Langley Research Center, USA; Dopker, Bernard, Boeing Commercial Airplane Co., USA; Shah, Bharat, Lockheed Martin Aeronautical Systems, USA; 1998; 14p; In English; 35th; Structures, Structural Dynamics, and Materials Conference, 20-23 Apr. 1998, Long Beach, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-1998-208213; NAS 1.15:208213; AIAA Paper 98-1708; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results from an experimental and analytical study of two composite sandwich fuselage side panels for a transport aircraft are presented. Each panel has two window cutouts and three frames and utilizes a distinctly different structural concept. These panels have been evaluated with internal pressure loads that generate biaxial tension loading conditions. Design limit load and design ultimate load tests have been performed on both panels. One of the sandwich panels was tested with the middle frame removed to demonstrate the suitability of this two-frame design for supporting the prescribed biaxial loading conditions with twice the initial frame spacing of 20 inches. A damage tolerance study was conducted on the two-frame panel by cutting a notch in the panel that originates at the edge of a cutout and extends in the panel hoop direction through the window-belt area. This panel with a notch was tested in a combined-load condition to demonstrate the structural damage tolerance at the design limit load condition. Both the sandwich panel designs successfully satisfied all desired load requirements in the experimental part of the study, and experimental results from the two-frame panel with and without damage are fully explained by the analytical results. The results

of this study suggest that there is potential for using sandwich structural concepts with greater than the usual 20-in. wide frame spacing to further reduce aircraft fuselage structural weight.
Author
Composite Structures; Sandwich Structures; Fuselages; Panels; Internal Pressure; Axial Loads; Load Tests; Pressure Distribution; Structural Design; Structural Weight

19980111021 NASA Lewis Research Center, Cleveland, OH USA
Temperature Distribution in a Composite of Opaque and Semitransparent Spectral Layers
Siegel, Robert, NASA Lewis Research Center, USA; Journal of Thermophysics and Heat Transfer; 1997; Volume 11, No. 4, pp. 533-539; In English
Report No.(s): NASA/TM-97-207858; NAS 1.15:207858; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The analysis of radiative transfer becomes computationally complex for a composite when there are multiple layers and multiple spectral bands. A convenient analytical method is developed for combined radiation and conduction in a composite of alternating semitransparent and opaque layers. The semi- transparent layers absorb, scatter, and emit radiation, and spectral properties with large scattering are included. The two-flux method is used, and its applicability is verified by comparison with a basic solution in the literature. The differential equation in the two-flux method Is solved by deriving a Green's function. The solution technique is applied to analyze radiation effects in a multilayer zirconia thermal barrier coating with internal radiation shields for conditions in an aircraft engine combustor. The zirconia radiative properties are modeled by two spectral bands. Thin opaque layers within the coating are used to decrease radiant transmission that can degrade the zirconia insulating ability. With radiation shields, the temperature distributions more closely approach the opaque limit that provides the lowest metal wall temperatures.
Author
Aircraft Engines; Differential Equations; Temperature Distribution; Radiative Transfer; Radiation Distribution

19980137412 Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine, France
Aluminum Alloy Forgings Property/Performance Attributes Focus: Fatigue and Durability Service Capabilities ***Les Pieces Forgees en Alliage d'Aluminium les Attributs de Performance/Caracteristiques Themes: Fatigue et Durabilite Capacites en Service***
May 1998; 64p; In English
Report No.(s): AGARD-AR-353; ISBN 92-836-1074-1; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche

Historically, many aluminum aircraft components have been made from forgings. However, to reduce airframe manufacturing cost aircraft manufacturers are converting to parts machined from thick plate. The results of recent research indicates that forgings often offer significant advantages over components machined from plate. The purpose of this report is to present this information.
Author
Airframes; Aluminum Alloys; Loads (Forces); Fatigue (Materials); Durability; Forging; Aircraft Reliability

12
ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

19980073294 NASA Langley Research Center, Hampton, VA USA
Wake Vortex Radar System Development: Overview
Neece, Robert T., NASA Langley Research Center, USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 299-308; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The objectives of the work are to: (1) Investigate microwave and millimeter wave sensors to locate, track, quantify, and observe the wake vortex hazard; (2) Develop and evaluate system concepts and designs using sensor system models and employ-

ing a theoretical reflectivity model for the wake vortex; (3) Test the validity of the theoretical model; (4) Acquire sensor systems and conduct field testing to evaluate; and to (5) Refine a system for field testing as a wake vortex sensor.
CASI
Microwave Sensors; Vortices; Aircraft Wakes; Radar Measurement; Optical Radar

14
LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

19980096465 Hughes Training, Inc., Falls Church, VA USA
Human Factors Integration: Cost and Performance Benefits on Army Systems ***Final Report***
Booher, Harold R., Hughes Training, Inc., USA; Jul. 1997; 61p; In English
Contract(s)/Grant(s): DAAL01-95-C-0121; DA Proj. 1L1-62716-AH-70
Report No.(s): AD-A330776; ARL-CR-341; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents and, to the degree possible, quantifies the benefits of human factors integration (HFI) effort to selected Army programs. Four Army weapon systems were identified for documenting HFI lessons learned and quantitative benefits. These systems are two aviation systems, Comanche and Apache; one nuclear, biological, chemical (NBC) reconnaissance vehicle, Fox; and the Army's advanced howitzer program, Crusader. The Comanche aircraft provides the most comprehensive lessons learned for HFI, based on its application of the Army's manpower and personnel integration (MANPRINT) program from its inception. The Apache helicopter provides some quantitative examples of benefits from HFI applications on design and development of changes to a system already in the Army inventory. The Fox reconnaissance vehicle (XM93E1 NBC) demonstrates quantitative benefits and lessons learned from HFI applications on a non-major system. The Crusader was chosen because it illustrates the critical role played by HFI technologies in conducting realistic battlefield scenarios in war games. Attention is given to the effects of HFI in five major areas: (1) The acquisition process; (2) System design and development; (3) Operational performance and testing; (4) Cost avoidance, and (5) Safety benefits.
DTIC
Human Factors Engineering; Helicopters; Systems Engineering; Reconnaissance; Howitzers; Manpower

19980111102 Oklahoma Univ., School of Industrial Engineering, Norman, OK USA
A Human Factors Perspective On Human External Loads ***Final Report***
Shehab, Randa L., Oklahoma Univ., USA; Schlegel, Robert E., Oklahoma Univ., USA; Palmerton, David A., Civil Aeromedical Inst., USA; May 1998; 34p; In English
Contract(s)/Grant(s): DTFA02-95-T-80473
Report No.(s): DOT/FAA/AM-98/13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Title 14 part 133 of the Federal Code of Regulations (14 CFR 133) titled, "Rotorcraft External Load Operations," describes the operation and certification rules governing helicopter external load operations. Specifically, part 133.45 addresses rotorcraft operations involving human external loads (HELS) and the design of personnel lifting devices used in HEL operations. to determine if there is a need for imposing new regulations on HEL operations, the Rotorcraft Standards Directorate of the Aircraft Certification Service requested the Civil Aeromedical Institute to review all available accident databases to determine if HEL operations are unsafe or sufficiently problematic to warrant a change in the existing regulations. This report investigates HEL accidents, categorizes commercially available equipment used in different personnel lifting operations, and provides human-factor related recommendations affecting the use of these HEL lifting devices. A review of accident data between 1973 and 1996 from several databases did not reveal any accident trends or highlight any specific safety issues related to HEL operations. A review of commercially-available HEL equipment showed the devices were designed for either short-term, rescue-type operations or long-term, work-related activities where the user is required to remain in the device for extended periods of time. Suggestions concerning the safety, comfort, and use of HEL devices are provided, as well as recommendations that standard operating procedures, training for HEL crew members, and minimal equipment specifications be added to the current regulation.
Author
Rotary Wing Aircraft; Human Factors Engineering; Loads (Forces); Regulations; Helicopters; Aerospace Medicine; Certification

15
MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

19980073306 Northwest Research Associates, Inc., Bellevue, WA USA
Development of Wake Vortex Prediction Algorithms
Delisi, Donald P., Northwest Research Associates, Inc., USA; Robins, Robert E., Northwest Research Associates, Inc., USA; Proceedings of the NASA First Wake Vortex Dynamic Spacing Workshop; Nov. 1997, pp. 469-488; In English; Also announced as 19980073273; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Wake vortex prediction algorithm are developed that model the essential physics; handle atmospheric parameters; handle out-of-ground effect, near ground effect, and in-ground effect; and runs quickly on a PC or workstation. In this project the following tasks are performed: (1) Predictor algorithm results have been compared with data for vortices in and out of ground effect; (2) Algorithm works reasonably well but needs refinement; and (3) Current predictor algorithm will be used at DFW.
CASI
Algorithms; Aircraft Wakes; Vortices; Turbulent Wakes; Atmospheric Effects

16
PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

19980119846 Florida Atlantic Univ., Center for Acoustics and Vibration, Boca Raton, FL USA
Broadband Fan Noise Generated by Small Scale Turbulence ***Final Report***
Glegg, Stewart A. L., Florida Atlantic Univ., USA; Apr. 08, 1998; 106p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG1-1202
Report No.(s): NASA/CR-1998-207752; NAS 1.26:207752; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report describes the development of prediction methods for broadband fan noise from aircraft engines. First, experimental evidence of the most important source mechanisms is reviewed. It is found that there are a number of competing source mechanism involved and that there is no single dominant source to which noise control procedures can be applied. Theoretical models are then developed for: (1) ducted rotors and stator vanes interacting with duct wall boundary layers, (2) ducted rotor self noise, and (3) stator vanes operating in the wakes of rotors. All the turbulence parameters required for these models are based on measured quantities. Finally the theoretical models are used to predict measured fan noise levels with some success.
Author
Fan Blades; Noise (Sound); Turbulence; Wakes; Noise Reduction; Noise Intensity; Aerodynamic Noise

17
SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

19980096368 Aviation Training Association, UK
Standards: The Key to Competence
Hines, Tony, Aviation Training Association, UK; Technical Training: The Way Forward; 1997; 20p; In English; Also announced as 19980096367; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ) US Sales Only, Hardcopy, Microfiche

National occupational standards are now available for virtually every occupation. For the aviation industry, they have been developed by AIVSC to meet the needs of employers and, where appropriate, to complement the regulatory requirements. Standards of competence include performance criteria that provide for objective assessment and constructive feedback on performance. Standards of competence can be used for a number of human resource management purposes. Vocational qualifications at appropriate levels within the national framework have been developed for a wide range occupation, based on AIVSC standards. For aircraft maintenance engineering, an industry specification has been produced by AIVSC, to complement European Joint Air-

worthiness Requirements (JARs), as a basis for vocational qualifications. Modern apprenticeships are now available, based on industry standards, NVQ and Key skills, for a wide range of occupations in the aviation industry. There can be no doubt that standards are the key to competance and should be used widely by every employer in the industry.
CASI
Aircraft Industry; Resources Management; Standards; Education

19980096369 Civil Aviation Authority, Safety Regulations Group, London, UK
Training: An Integrated Approach Within the JAA
McKenna, James, Civil Aviation Authority, UK; 1997; 11p; In English; Also announced as 19980096367; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ) US Sales Only, Hardcopy, Microfiche

The introduction of JAR-66 entitled ”Certifying Staff- Maintenance and JAR-147, Approved Maintenance Training Organizations in 1998” represents a watershed in Europe for the training and qualification of maintenance staff. For the first time a ”harmonized” licensing requirement will be applied by the 27 JAA member states. The resulting licensing standards will support the maintenance and flight operations requirements outlined in JAR-OPS and JAR-145. It is only with their introduction that the full range of complementary requirements will be in place. ”Harmonization” and ”level playing field” are terms often used to describe the intent of the JAA requirements. It is clear that these new maintenance qualification requirements must be openly accepted by the regulators and industry alike since it is obvious that the commitment of both parties is essential to their success. Many concerns have been voiced during the development process and these cover the whole spectrum. Some critics have openly suggested that the new requirements represent only a lowering of standards. Whilst this may be true in some countries where the current qualification standards may be more onerous it does not mean that the process is being reduced to a token gesture. It is more important to recognize that the new requirements seek to establish common high standards of airworthiness and safety. Aviation safety is not something we can afford to be complacent about and despite whatever compromise may be perceived to have been put in place the JAA member States will maintain their focus and commitment to safety. The qualification process for maintenance staff should not only prepare them for the tasks they are employed to do but which instills a basic underpinning competence to look beyond simply the task at hand. It is essential therefore that training is an integral part of the system and that the industry assumes an active role in supporting these staff. The airlines and maintenance organizations have a responsibility to manage safety. Despite the temptation to cut training budgets or rely upon other organizations to train for the industry, perhaps it is about time that the industry accepted the need for a co-ordinated approach to training to ensure consistent, known and competent staff. I believe that given the opportunity JAR-66 and JAR-147 will introduce such a set of requirements with an element of flexibility in the licensing structure and these are considered likely in the future to contribute significantly to the ability of the aviation industry to maintain or improve safety standards.
Author
Aircraft Industry; Civil Aviation; Licensing; Maintenance Training

19980096371 Royal Electrical and Mechanical Engineers Association, School of Electronic and Aeronautical Engineering, Arborfield, UK
Training the Army Aircraft Technician for the 21st Century
Cameron, Stuart, Royal Electrical and Mechanical Engineers Association, UK; 1997; 8p; In English; Also announced as 19980096367; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ) US Sales Only, Hardcopy, Microfiche

The British Army employs helicopters worldwide in support of its deployments. Operated by the Army Air Corps and maintained by the Royal Electrical and Mechanical Engineers (REME) these are vital assets to the success of the mission, especially in the post Cold War era of rapid flexible deployments across the broad spectrum of tasks faced by the fighting services. To ensure that they are available when required, REME has adopted a policy of forward repair. Technicians and engineers are positioned in the operational area to enable the maintenance to be carried out as close to the point of operation as feasible. The unique concept of REME support has demanded a trade structure and competency which allows the economic deployment of a flexible maintenance support. REME relies on 2 technician trade groups to support Army Aircraft, the Aircraft Technician and the Avionic Technician. Their formal training, as with the aircraft engineer, is the responsibility of the School of Electronic and Aeronautical Engineering. The paper describes the technician career progression within REME, the process by which the career courses for the technicians have been developed and the manner in which the delivery of training is validated to ensure that it meets the needs of the customer. It also develops the aspiration to achieve civilian qualifications, specifically NVQs, to enable the Corps to recruit and retain the high quality soldiers that it requires to meet the challenges of the 21st Century.
Author
Aeronautical Engineering; Maintenance Training; Education; Military Aviation

Subject Term Index

A

ACOUSTICS, 13
AERODYNAMIC NOISE, 17
AERONAUTICAL ENGINEERING, 18
AEROSPACE MEDICINE, 16
AIR BREATHING ENGINES, 14
AIR TRAFFIC, 1
AIR TRAFFIC CONTROL, 7, 10, 11
AIR TRAFFIC CONTROLLERS (PERSONNEL), 10
AIR TRANSPORTATION, 1
AIRCRAFT APPROACH SPACING, 7, 8, 9, 11
AIRCRAFT DESIGN, 12
AIRCRAFT ENGINES, 15
AIRCRAFT INDUSTRY, 18
AIRCRAFT PILOTS, 10
AIRCRAFT RELIABILITY, 15
AIRCRAFT SAFETY, 1, 11
AIRCRAFT WAKES, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16, 17
AIRFRAMES, 15
AIRPORTS, 1, 11
ALGORITHMS, 17
ALUMINUM ALLOYS, 15
ANEMOMETERS, 5
ATMOSPHERIC BOUNDARY LAYER, 3
ATMOSPHERIC EFFECTS, 10, 17
ATMOSPHERIC MODELS, 2, 6
ATMOSPHERIC STRATIFICATION, 4
ATMOSPHERIC TURBULENCE, 3, 8, 9, 12
AUTOMATIC CONTROL, 1
AXIAL FLOW, 4
AXIAL LOADS, 15

C

CALIBRATING, 10
CERTIFICATION, 16
CIVIL AVIATION, 11, 18
COHERENT RADAR, 4
COLLISION AVOIDANCE, 11
COMMUNICATING, 13
COMPOSITE STRUCTURES, 15
COMPUTERIZED SIMULATION, 2, 4, 5, 9, 11
CONFERENCES, 7
COST ANALYSIS, 11
COST EFFECTIVENESS, 11

D

DATA ACQUISITION, 12
DATA BASES, 12
DATA INTEGRATION, 12
DEPLOYMENT, 11
DESIGN ANALYSIS, 12
DETECTION, 5, 9
DIFFERENTIAL EQUATIONS, 15
DISPLAY DEVICES, 12
DURABILITY, 15

E

EDUCATION, 18
ELECTROMAGNETIC RADIATION, 13
EUROPE, 12

F

FABRICS, 6, 7
FAN BLADES, 17
FATIGUE (MATERIALS), 15
FLIGHT HAZARDS, 6
FLIGHT INSTRUMENTS, 14
FLIGHT SIMULATORS, 12
FLIGHT TESTS, 10
FLOW DISTORTION, 6
FLOW MEASUREMENT, 4, 9
FLOW STABILITY, 4, 10
FLUTTER, 6
FLUTTER ANALYSIS, 7
FOG, 6
FORCE DISTRIBUTION, 6, 13
FORECASTING, 11
FORGING, 15
FUSELAGES, 15

G

GLASS FIBERS, 7
GLOBAL POSITIONING SYSTEM, 12
GROUND EFFECT (AERODYNAMICS), 2, 3

H

HELICOPTERS, 16
HISTORIES, 8
HOWITZERS, 16
HUMAN FACTORS ENGINEERING, 10, 14, 16
HUMAN-COMPUTER INTERFACE, 12
HYPERSONIC AIRCRAFT, 14
HYPERSONICS, 14

I

INDUSTRIAL MANAGEMENT, 11
INFORMATION SYSTEMS, 12
INTERNAL PRESSURE, 15

L

LARGE EDDY SIMULATION, 3
LICENSING, 18
LIFT, 13
LOAD TESTS, 15
LOADS (FORCES), 13, 15, 16

M

MAINTENANCE TRAINING, 18
MANPOWER, 16
MATHEMATICAL MODELS, 5, 10, 11
MEMBRANES, 6, 7
METEOROLOGICAL INSTRUMENTS, 13
METEOROLOGICAL PARAMETERS, 6
METEOROLOGY, 6
MICROWAVE SENSORS, 16
MILITARY AVIATION, 18

N

NASA PROGRAMS, 11
NOISE (SOUND), 17
NOISE INTENSITY, 17
NOISE REDUCTION, 17
NUMERICAL WEATHER FORECASTING, 6

O

OPTICAL RADAR, 4, 5, 9, 16
OPTICAL SCANNERS, 4

P

PANELS, 15
PILOT TRAINING, 14
PLANETARY BOUNDARY LAYER, 3
POLYTETRAFLUOROETHYLENE, 7
PRESSURE DISTRIBUTION, 15
PROBABILITY THEORY, 12
PROJECT MANAGEMENT, 11
PROTOTYPES, 11
PULSED LASERS, 5

R

RADAR MEASUREMENT, 5, 16
RADIATION DISTRIBUTION, 15
RADIATIVE TRANSFER, 15
RAMAN LASERS, 5
RECONNAISSANCE, 16
REGULATIONS, 16
RELIABILITY ANALYSIS, 1
REPORTS, 12
RESOURCES MANAGEMENT, 18
ROLL, 10
ROLLING MOMENTS, 13
ROTARY WING AIRCRAFT, 16
RUNWAYS, 11

S

SANDWICH STRUCTURES, 15
SHEAR LAYERS, 2
SIMULATION, 10
SODAR, 5
SOLID STATE LASERS, 5
STANDARDS, 18
STRATEGY, 11
STRUCTURAL DESIGN, 15
STRUCTURAL WEIGHT, 15
SUBSONIC SPEED, 13
SYSTEMS ANALYSIS, 1
SYSTEMS ENGINEERING, 10, 11, 12, 16

T

TEMPERATURE DISTRIBUTION, 15
THIN AIRFOILS, 7
THREE DIMENSIONAL MODELS, 2
TRANSPORT AIRCRAFT, 12
TURBULENCE, 17
TURBULENCE EFFECTS, 3
TURBULENCE MODELS, 2, 3, 4
TURBULENT BOUNDARY LAYER, 3
TURBULENT WAKES, 17
TWO DIMENSIONAL MODELS, 9

U

UNIFORM FLOW, 6, 7

V

VISUAL PERCEPTION, 14
VORTEX ADVISORY SYSTEM, 7
VORTEX ALLEVIATION, 6, 9, 10
VORTEX AVOIDANCE, 9
VORTEX BREAKDOWN, 9
VORTEX LATTICE METHOD, 13
VORTICES, 2, 3, 4, 5, 6, 7, 8, 9, 10, 16, 17

W

WAKES, 17
WARNING SYSTEMS, 11
WEATHER, 1
WEATHER FORECASTING, 10
WIND SHEAR, 2
WIND TUNNEL TESTS, 6, 7, 10
WIND TUNNELS, 13
WING TIP VORTICES, 2, 3, 9, 11, 12

Personal Author Index

A

Ambur, Damodar R., 14
Arya, S. Pal, 2, 3

B

Barker, Ben C., Jr., 5
Bonesteel, Charles, 1
Booher, Harold R., 16
Brandon, Jay, 10
Britt, Charles L., 5
Brockman, Philip, 4
Burnham, David C., 5, 8

C

Cameron, Stuart, 18
Corjon, Alexandre, 3
Creduer, Leonard, 7
Crisp, Vicki K., 10

D

Darracq, Denis, 3
DeCroix, David, 2
Decros, Frederic, 3
Delisi, Donald P., 4, 17
Dopker, Bernard, 14

E

Eardley, D., 13
Evans, James E., 11

G

Gerz, Thomas, 3
Glegg, Stewart A. L., 17
Greene, George C., 6, 7, 10

H

Hallock, James N., 8
Han, Jongil, 3
Hannon, Stephen M., 9
Hanson, Dave, 1
Heinrichs, Richard M., 4
Henderson, Sammy W., 9
Hines, Tony, 17
Hinton, David A., 7, 9, 10
Holzaepfel, Frank, 3
Hunt, James L., 13

K

Kanki, Barbara G., 10
Kao, C.-T., 2, 3
Katz, J., 13
Kawamura, Sumio, 6
Koch, Grady J., 5
Kolitz, Stephan, 1
Kostiuk, Peter, 1

L

Lee, David A., 1
Leong, Frank, 1
Lin, Yuh-Lang, 2, 3
Lytle, Carroll, 5

M

Marshall, Robert E., 5
Mavris, Dimitri N., 12
McKenna, James, 18
Minami, Hirokazu, 6
Mudukutore, Ashok, 5
Murray, James, 5

N

Neece, Robert T., 15
Nelson, Caroline, 1
Nguyen, Chi, 5

O

Okuda, Yasuo, 6

P

Palmerton, David A., 16
Perry, R. Brad, 7
Phillips, Mark W., 9
Proctor, Fred, 2

R

Rankenburg, Joerg, 11
Rausch, Vincent L., 13
Rennick, Sydney, 11
Rivers, Robert, 10
Robins, Robert E., 4, 17
Rosch, Gene, 1
Rossow, Vernon, 10
Rossow, Vernon J., 13
Rouse, Marshall, 14
Rudis, Robert P., 5, 8

S

Sarpkaya, Turgut, 8
Schlegel, Robert E., 16
Shah, Bharat, 14
Shah, Gautam, 10
Shapiro, Gerald, 1
Shehab, Randa L., 16
Shen, S., 2
Siegel, Robert, 15
Spalart, Philippe, 8
Spitzer, Edward A., 8
Stewart, Eric, 9, 10
Still, D. L., 14
Stuever, Robert, 10
Switzer, George, 9

T

Tardif, Robert, 6
Temme, L. A., 14
Thomson, J. Alex, 9
Turner, Julie, 11

V

Vicroy, Dan, 10

W

Williams, Kevin W., 12

Z

Zheng, Zhong-Quan Charlie, 4
Zwack, Peter, 6

Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA/SP—1998-7037/SUPPL378		

4. Title and Subtitle	5. Report Date
Aeronautical Engineering A Continuing Bibliography (Supplement 378)	July 10, 1998
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address NASA Scientific and Technical Information Program Office	11. Contract or Grant No.
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Langley Research Center Hampton, VA 23681	13. Type of Report and Period Covered Special Publication
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This report lists reports, articles and other documents recently announced in the NASA STI Database.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Aeronautical Engineering Aeronautics Bibliographies	Unclassified – Unlimited Subject Category – 01

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	46	A03/HC

For sale by the NASA Center for AeroSpace Information, 7121 Standard Drive, Hanover, MD 21076-1320